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Vortex Splash Guards

DEPT. OF TRANSPORTATION

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Docket No .NHTSA-99-5101 - 15
Docket Management, Room PL-401
U.S.Department of Transportation
400SeventhStreet,S.W.
Washington, D.C. 20590

We are excited to hear that the issue of Crash Avoidance/Splash Spray is very much alive. Our hats off to the NHTSA for their efforts regarding this very serious initiative. We are very interested in assisting you in your efforts to ensuring safer roads.

We have patented a product that is poised to revolutionise the splashguard/mudflap/fender industry.

Vortex Splash Guards captures, controls, channels and directs air and spray forcing it rearward and downward through, the use of louvers, behind the moving vehicle thus enhancing visibility for both oncoming and following traffic, particularly in passing scenarios. Monsanto, who when efforts to force legislation failed, do to the inability to measure splash and spray effectively, sold their product several years ago to Symplastics. The golf shoe bristle like addition to a traditional mud flap appeared to test effect vely on a stand-alone basis. When, wind pressure from the vehicle, tires and motion are introduced, it merely assists in a lift effect causing spray "hang time". Air from a moving tire exerts an upward pressure. Spray and air then exit in all directions with the majority to the sides - path of least resistance. To reiterate this causes significant vision impairment to both oncoming and following vehicles a major cause for collisions.

The Pick-Up Truck, SUV & Tractor-Trailer markets are primarily interested in utilizing the most advanced high tech safety and aerodynamically designed accessories available. An optional fender-to-fender version would enhance additional protection for those who trailer campers, boats, personal watercraft or any other precious cargo they wish to shield.

We recognize OEM's spend multiple millions of dollars into designing vehicles that maximize fuel efficiency and safety. We at Vortex Splash Guards realize that by incorporating the louvered design, which evidently is one of the fundamental aerodynamic features on GM.'s show piece (Cadillac North Star LMP Lemans racer), we have the ingredients to set the standard in the splashguard/mud flap/ fender industry. Vortex splash guards accomplish everything the louvered design was intended to do on the LMP and more; offering minimal resistance, which means increased fuel efficiency, reduction of destructive friction heat improving tire tread life, cooler breaks and, most importantly, dramatically enhancing splash/spray control. No extra charge for the incredibly stunning aesthetic aerodynamic profile.

Please find attached our Press Release that highlights additional considerations and acknowledgement of patent ownership. Also attached are pictures illustrating the use of louvers on the G.M. Cadillac North Star LMP Lemans racer and Ford F150.

We are excited about the possibilities to either supply or partner with OEM's or any other auto accessories manufacturer, who is known for embracing innovation to its fullest potential.. We would consider an endorsement or any other direction from NHTSA to be an invaluable platform to launch this, "avant-garde", Vortex technology worldwide.

Sincerely,

Mark Morin

85 Odds Dr. Restoule, Ontario Canada

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U.S Patent #4,921,276 Canadian Patent #1,217,521



Press Release

Vortex Splash Guards

Innovative designed Splashguards get noticed.

Vortex Splashguards have developed an innovative, patented designed splashguard (that's mud flaps for all you good ol' boys) that set the standards in wheel spray control.

This concept has derived from years of testing that include wind tunnel and World class competition track proving grounds. General Motors has incorporated the louvered fender/spray flaps into their hi-Tec championship LMP LaMans 24-hour racer.

The louvered splashguards incorporate an inherent safety aspect where the water that exits the wheels is channelled into the flap and then deflected downward for a controlled exit of water & air. As speeds increase the flaps actually become more effective while the opposite is true with current offerings. The louvers cause a vortex (hence its name) that draws the flaps down with wind velocity and carrying with it water and debris of any sort from the wheels. Side misting (water spray) of the truck/trailer combo is dramatically reduced with this design that aids in increased visibility from on coming and following traffic.

Tests have also concluded that in extreme conditions the Vortex louvers actually reduce tire and brake operating temperatures that can prolong brake effectiveness and tire life- again another safety concern.

With many safety items aesthetics are compromised – not so with the Vortex Splashguards. These high quality units look cool on a classic Freightliner, an aerodynamic kW T-2, your favourite dually, pickup or SUV. The integrity of the product is outstanding as the louvers add rigidity as well as functionality. An intricate injection mould process with 21st century polymer UV stable plastics insures consistent long-term durability.

Sizing is offered in most standard truck/trailer configurations and feature the choice of tear out bolt pattern or it can be mounted with the non-damaging tension holding device developed by Spray Controls in MN.

Yet another bonus - the capability of fleets identifying themselves as leaders in safety by featuring their custom corporate logo or message across bottom of the guards in a durable colour that is lifetime heat sealed.

The pricing for this high quality product is competitive with loosely comparable mud flaps due to advancements in manufacturing technologies. The patented designed splashguards are available in black only and sold in pairs with a choice of personalised or corporate identity on special orders.

For inquires contact Mark Morin via fax @ 425-930-6372 fx or e-mail to vortexguards@yahoo.com

VORTEX SPLASHGUARDS FEATURES AND BENEFITS

Design considerations - Louvers captures, controls and channels air, spray and debris rearward and downward through the guards ports as mounted behind a vehicles wheels. A vortex or low pressure is created through the louver from the forward motion of the vehicle

Purpose - On coming vehicles have greater visibility to view approaching vehicles in wet conditions particularly with transport/trailer combos. Vehicles behind the transports have greater visibility for passing

Aerodynamic efficiency is constant as vortex airflow results in a minimal wind resistant guard resulting in improved fuel economy

Further splash and spray efficiency can be realised by adding across the entire rear of the tractor and particularly the trailer

The vortex airflow releases friction heat created from tires, particularly in extreme conditions tire treads lasts longer, brakes run cooler

Aerodynamic technology utilised by Lemans racing vehicles particularly illustrated on the Cadillac North Star LMP

Vortex technology creates a 3 dimensional profile resulting in a radically improved aesthetic design concurrent with new millennium vehicle engineering

Vortex technology is unique, never before offered ; flaps last longer; a need for reinforcement hardware to keep flaps straight is not necessary

Direct replacement for existing low-tech "mud flaps"

Designed to minimise stone and gravel damage to following vehicles due to guard remaining more perpendicular to the road for maximum coverage at speeds.

Improved fleet corporate safety image. Corporate or personalised identification guards available on special orders

Patented design that eliminates the possibility of inferior designs being offered
Distribution offered available in US and in Canada

Manufactured in the US from the latest in UV plastic and manufacturing technology and are indestructible in normal use. Guard colour is exclusively black, as carbon content is imperative

First generation are available in most tractor, trailer, dually, pickups and SUV sizes.
Additional markets include RV's and Buses.

Developing markets include, automobiles, motorcycles, ATV's, and snow mobiles

Splash Guards are designed to stay in place without the use of brackets or supports and have a special tear-through hole-mounting pattern that will not totally destroy the guard in the event of a " back over". They can be mounted with a special no tear mounting device

United States Patent [19]

Morin

[11] Patent Number: 4,660,846

[45] Date of Patent: Apr. 28, 1987

[54] SPRAY SHIELD FOR AUTOMOTIVE VEHICLES

[76] Inventor: Albert Z. Morin, Apt. 801, 2200
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[21] Appl. No.: 799,344

[22] Filed: Nov. 18, 1985

[51] Int. Cl.⁴ B62D 25/16

[52] U.S. Cl. 280/154.5 R

[58] Field of Search 280/154.5 R, 152 R,
280/154.5 A; 98/121.2

[56] References Cited

U.S. PATENT DOCUMENTS

1,904,343	4/1933	Zaiger et al.	280/154.5 R
2,326,408	8/1943	Strawsine	98/121.2 X
2,605,119	7/1952	Earnest	280/154.5 R
2,782,053	2/1957	Long	280/154.5 R
2,857,200	10/1958	Hoppesch	280/154.5 R
3,350,114	10/1967	Salisbury	280/154.5 R
4,382,606	5/1983	Lightle et al.	280/154.5 R

FOREIGN PATENT DOCUMENTS

360425	9/1936	Canada .
694985	9/1964	Canada .
1280695	10/1968	Fed. Rep. of Germany ... 280/154.5 R

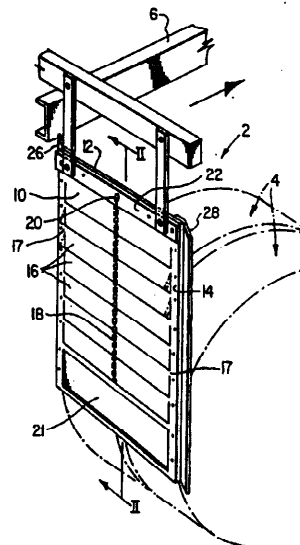
Primary Examiner—John J. Love

Assistant Examiner—Michael Mar
Attorney, Agent, or Firm—Burke-Robertson, Chadwick
& Ritchie

[57] ABSTRACT

A spray shield and system for controlling the spray generated by the wheels of automotive vehicles when travelling on a roadway surface. The shield is adapted to be disposed above the roadway surface vertically depending from the vehicle and spaced rearwardly from a vehicle wheel in a plane extending transversely to the vehicle. The shield is in sheet form and has front and rear surfaces and top and side borders. A plurality of downwardly depending, contiguous flaps extend, when the shield is in position on the vehicle, horizontally between the side borders, the flaps to permit flow of air and spray through the shield and cause downward deflection thereof. A pair of air deflection surfaces, to be vertically oriented during operation, one extending outwardly along each of the side borders and each angled with respect to the front surface of the spray shield are provided to deflect air and spray laterally, from one side of the shield to the other. The shield according to the present invention significantly reduces the hazard created by spray generated by a vehicle's tires by deflecting the spray downwardly and in a particular lateral direction, for example to the shoulder side of the vehicle.

9 Claims, 4 Drawing Figures



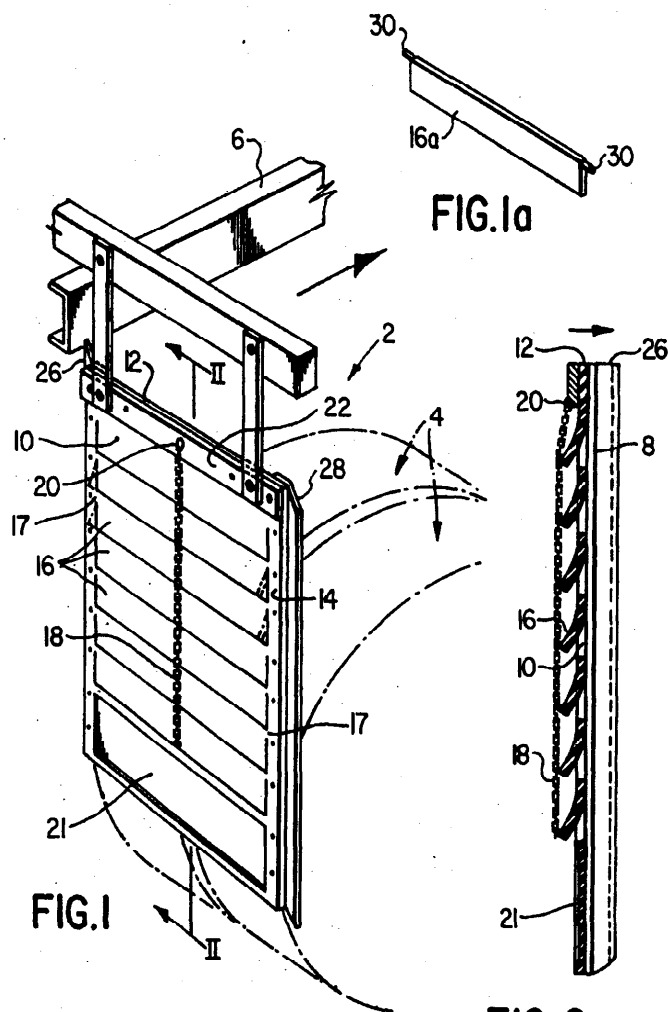
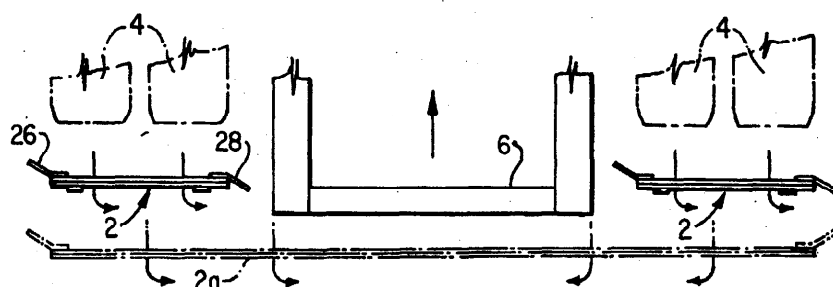


FIG. 2



SPRAY SHIELD FOR AUTOMOTIVE VEHICLES

FIELD OF THE INVENTION

The present invention relates to a spray shield and a system using a plurality of such spray shields, for controlling the spray generated by the wheels of automotive vehicles. It relates more particularly to a spray shield or splash guard that is adapted to be suspended in generally vertical orientation and disposed rearwardly of the vehicles' wheels to obstruct the spray of rain, dust, snow and rocks which may be thrown upwardly and rearwardly or laterally by the wheel. It also relates to a system incorporating one or a number of such spray shields to deflect the spray in a particular direction, for example underneath or towards one side of the vehicle.

BACKGROUND OF THE INVENTION

Particularly with heavy vehicles such as trucks, tractor trailers and buses, rain, snow, dust and rocks may be sprayed during movement, depending upon the type and condition of the roadway upon which such vehicle is travelling. Such spray may make it impossible to pass the vehicle safely or make it dangerous or hazardous to follow behind. When there is moisture on the roadway, this spray, at times, may be so intense as it is thrown on to the windshields of following vehicles that driving visibility may be reduced to a dangerous minimum. Similarly, since the spray is thrown laterally by the wheels of tractor trailers having multiple wheel systems, a similar problem is developed with respect to vehicles attempting to pass such tractor trailers. Because the wheels of such trucks are so large, water may be thrown laterally from the top of these wheels at the level of passenger car windshields, again producing a serious hazard to such a vehicle which attempts to pass a tractor trailer.

Such a problem has been previously recognized and many solutions proposed. For example U.S. Pat. Nos. 1,904,343, issued Apr. 18, 1933, to Zaiger, et al., and U.S. Pat. No. 4,382,606, issued May 10, 1983, to Lightle, et al., and Canadian Pat. No. 360,425, issued Sept. 8, 1936, to Cohen describe and illustrate different constructions of spray shields for automobiles consisting of solid sheets of varying surface contours. Such constructions, providing a solid wall against which the spray from the wheel is projected, tend to deflect the spray laterally. In the case of the Lightle, et al. device, the surface against which spray is projected is provided with a matrix of upstanding projections which would tend to collect mud and dirt and, in cold climates, snow and ice, thereby limiting its effectiveness. Long U.S. Pat. No. 2,782,053, issued Feb. 19, 1957 and Barry, et al. Canadian Pat. No. 694,985, issued Sept. 29, 1964, both describe and illustrate more complicated constructions of spray shields for vehicles, the shields being provided with louvers for permitting air and spray to pass through the shield but directing them downwardly as they pass through. The Long reference teaches a plurality of overlapping metal louvers, suspended downwardly at their ends, from spaced chains. In the Barry, et al. reference the louvers are fixed to the rear face of a screen panel. With such constructions made up of a number of mechanical parts, there is again a danger, in cold climates, that they will become frozen and/or clogged by snow and ice, thereby rendering them inoperative.

It is an object of the present invention to provide a spray shield which will deflect downwardly and to one side spray from the wheels of a vehicle. It is a further object of the present invention to provide such a device which will minimize air resistance against the forward surface of such a shield and which will be less prone to problems from cold driving conditions such as clogging or freezing. It is the further object of the present invention to provide such a spray shield which is relatively simple and economical to construct.

SUMMARY OF THE INVENTION

According to the present invention there is provided a spray shield for a wheel of an automotive vehicle for controlling the spray generated thereby when travelling on a roadway surface. It is adapted to be disposed above the roadway surface vertically depending from the vehicle and spaced rearwardly from a vehicle wheel in a plane extending transversely to the vehicle. The shield is in sheet form and has front and rear surfaces and top and side borders. A plurality of downwardly depending, contiguous flaps extend, when the shield is in position on the vehicle, horizontally between the side borders, the flaps to permit flow of air and spray through the shield and cause downward deflection thereof. A pair of air deflection surfaces, to be vertically oriented during operation, one extending outwardly along each of the side borders and each angled with respect to the front surface of the spray shield, are provided to deflect air and spray laterally, from one side of the shield to the other.

In a preferred embodiment of the present invention, a link means such as a rubberized chain joins each of the flaps and cooperates with a securing means associated with the shield to hold the flaps in a predetermined position. As well, the deflection surfaces are angled outwardly and forwardly on one side of the shield and outwardly and rearwardly on the other to provide a lateral deflection of air and spray from one side to the other of the shield. The spray shield according to the present invention can thus be used in a manner in which there is minimal air resistance to the shield, during operation, while at the same time spray of moisture, dust, snow, stones, etc., caused by the vehicle wheel are deflected downwardly and to one side (e.g. the roadway shoulder side) of a vehicle carrying spray shields according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the invention will become apparent upon reading the following detailed description and upon referring to the drawings in which:

FIG. 1 is a partial, perspective view of a vehicle carrying a spray shield according to the present invention;

FIGURE 1a is a perspective view of a replacement flap for a spray shield according to the present invention;

FIG. 2 is a cross-sectional view along line II—II of FIG. 1; and

FIG. 3 is a partial, schematic, plan view of a wheel set of a vehicle carrying spray shields according to the present invention illustrating their manner of operation.

While the invention will be described in conjunction with example embodiments, it will be understood that it is not intended to limit the invention to such embodiments. On the contrary, it is intended to cover all alter-

natives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

In the following description, similar features in the drawings have been given similar reference numerals.

Turning to FIG. 1 there is shown a perspective view of a spray shield 2 according to the present invention, suspended from the frame of vehicle 6 behind wheel 4. Shield 2 is in sheet form and is made up of front surface 8 and rear surface 10 as well as top border 12 and vertical side borders 14. Shield 2 is suspended above the roadway surface from vehicle 6, as illustrated, in vertical relationship to wheel 4 and spaced rearwardly therefrom in a plane extending transversely of the vehicle.

A plurality of downwardly depending, contiguous flaps 16 extend horizontally between the side borders 14. These flaps permit the flow of air and spray through the shield and cause downward deflection thereof. These flaps 16, as well as top border 12 and side borders 14 are made from a suitable sturdy, preferably flexible sheet material, for example rubber or plastic, and are preferably stamped from a single sheet for ease of construction. When thus constructed, flap 16 would pivot on uncut sections 17 extending between the flaps and side borders 14. A link means such as a rubberized chain 18 (shown in phantom in FIG. 1) preferably links each of the flaps for simultaneous, similar movement. An appropriate chain securing means 20 may be provided, for example on top border 12, to permit the user to secure the flaps in an appropriately predetermined open orientation as desired (FIG. 2).

Flaps 16 may extend from top border 12 to the bottom of spray shield 2, or alternatively a solid area 21 may be provided on the shield, for example, to carry a manufacturer's trade mark or the like, with the flaps 16 making up most of the rest of the area of the shield.

Along top border 12 (as illustrated) and side borders 14 (not illustrated) is preferably provided a reinforcing means such as a strip 22, preferably made of metal.

Extending along side borders 14, extending outwardly along each and angled with respect to front surface 8 are deflection surfaces 26 and 28. As can be seen in FIG. 2, deflection surface 26 is angled outwardly and forwardly while deflection surface 28 is angled outwardly and rearwardly with respect to the front surface 8. In this manner, air and spray deflected by the wheels 4 toward front surface 8 will be deflected not only downwardly by flaps 16, but also from left to right, in FIG. 2, as a result of the deflection surfaces 26 and 28. This would be an appropriate construction for a spray shield 2 for the passenger side of a vehicle where the driver sits on the left side. Of course, by appropriate selection of the angles of deflection surfaces 26 and 28, the lateral direction of air and spray may be controlled. Thus, in the wheel set schematically illustrated in FIG. 3, the lateral direction of spray from the wheels produced by spray shields 2 illustrated in full line would be from left to right. Alternatively, by angling the deflection surfaces, 26 and 28 oppositely in FIG. 3, so that the one which is forwardly angled became rearwardly angled, and vice versa (not illustrated), the lateral direction of the spray would be from right to left. Similarly, it would be obvious to one skilled in the art that deflection surfaces 26 and 28 on spray shields 2 could be ar-

ranged to laterally direct spray from the wheels towards the centre part of the vehicle.

In an alternative embodiment of the invention illustrated in phantom in FIG. 3, a single spray shield 2a of the construction described above may extend transversely across the vehicle behind all of the wheels 4 (preferably the rear wheels), to approximately direct the spray. In this case, by way of illustration, deflection surfaces 26 and 28 have been angled to deflect spray towards the centre of the vehicle.

Finally, as illustrated in FIGURE 1a, a replacement flap 16a may be provided to take the place of a regular flap 16 which has broken away. Replacement flap 16a would, for example, have a projection 30 on each side, towards the top, which would fit in an appropriately placed hole (not illustrated) on the inner surface of each of the side borders 14.

The spray shield according to the present invention provides many advantages over known prior art devices. In addition to providing minimal air resistance because of the openings provided by the flaps, and the downward deflection of air and spray as a result of these flaps, there is also a simultaneous direction of air and spray to a predetermined side of the spray shields, thereby providing significantly more control over the direction and disposition of spray thrown up by the vehicles' wheels. The shield provides for minimal build up of dirt which, on many of prior art spray shields providing a screen or solid surface, becomes a significant problem to the efficient operation of such prior art devices. The spray shield of the present invention is also extremely simple to manufacture, it being possible to stamp most of the shield from an appropriate sheet of rubber or plastic.

Thus there has been provided in accordance with the invention a spray shield for automotive vehicles that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the invention.

What I claim as my invention:

1. A spray shield for a wheel of an automotive vehicle for controlling the spray generated thereby when travelling on a roadway surface, the shield being in sheet form and having front and rear surfaces and top and side borders, and adapted to be disposed above the roadway surface vertically depending from the vehicle and spaced rearwardly from the vehicle wheel in a plane extending transversely to the vehicle, a plurality of vertically aligned, downwardly depending, contiguous flaps, each flap extending horizontally between the side borders when the shield is in position on the vehicle, the flaps to permit flow of air and spray through the shield and cause downward deflection thereof, and a pair of air deflection surfaces to be vertically oriented during operation, one extending outwardly along each of the borders and each angled with respect to the front surface of the spray shield to deflect air and spray laterally, from the side of the spray shield normally positioned adjacent the center of the roadway towards the side of the spray shield opposite thereto, wherein the air deflection surface along the border of the shield adjacent the center of the roadway is angled forwardly and

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outwardly with respect to the front surface of the shield and the other air deflection surface is angled outwardly and rearwardly with respect thereto.

2. A spray shield according to claim 1 wherein the flaps extend from the top border to the bottom of the shield.

3. A shield according to claim 1 wherein link means are provided joining each of the flaps for simultaneous and similar movement, and wherein a securing means is provided for the link means so that the flaps may be held in a position lifted a predetermined degree for free flow of air through the shield.

4. A shield according to claim 1 wherein the borders and flaps are made from a sheet of flexible material, the flaps being formed by appropriately cutting such sheet material.

5. A shield according to claim 4 in which the sheet material is heavy-duty rubber.

6. A shield according to claim 4 in which the borders are metal-reinforced.

7. A spray controlling system for automobile vehicles including in combination,

a vehicle having a wheel set and a body structure associated therewith; and

a plurality of spray shields according to claim 1 downwardly depending from the body structure of the vehicle each of the spray shields being associ-

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ated with one or more wheels of the vehicle wheel set and spaced rearwardly therefrom, the air deflection surfaces of the spray shields being angled to deflect air to a predetermined side of the spray shield.

8. A spray controlling system for automobile vehicles including in combination,

a vehicle having a wheel set and a body structure associated therewith; and

a plurality of spray shields according to claim 1 downwardly depending from the body structure of the vehicle each of the spray shields being associated with one or more wheels of the vehicle wheel set and spaced rearwardly therefrom, the air deflection surfaces of each spray shield being angled to deflect air laterally to the same side of the vehicle.

9. A spray controlling system for automobile vehicles including in combination,

a vehicle having wheel sets mounted on two or more axles and a body structure associated therewith;

a spray shield according to claim 1 downwardly depending from the body structure of the vehicle and extending transversely across the vehicle behind the wheels of an axle, the spray shield being spaced rearwardly from the wheels of that axle.

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United States Patent [19]

Morin

[11] Patent Number: 4,921,276

[45] Date of Patent: May 1, 1990

[54] SPRAY CONTROLLING FENDER

[76] Inventor: Albert Z. Morin, Apt. 801, 2200
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P3E 5S2, Canada

[21] Appl. No.: 197,601

[22] Filed: May 23, 1988

[51] Int. Cl.⁵ B62D 25/16

[52] U.S. Cl. 280/848; 280/851

[58] Field of Search 280/154.5 R, 153 R,
280/848, 851

[56] References Cited

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3,743,343	7/1973	Grote et al.	280/154.5 R
3,834,732	9/1974	Schons	280/154.5 R
3,922,003	11/1975	Lea	280/154.5 R
4,192,522	3/1980	Morgan	280/154.5 R
4,334,694	6/1982	Iwanicki	280/154.5 R
4,427,208	1/1984	Jurges	280/154.5 R
4,436,319	3/1984	Clutter	280/154.5 R
4,660,846	4/1987	Morin	280/154.5 R

FOREIGN PATENT DOCUMENTS

2165508	4/1986	United Kingdom	280/154.5 R
2191160	12/1987	United Kingdom	280/154.5 R

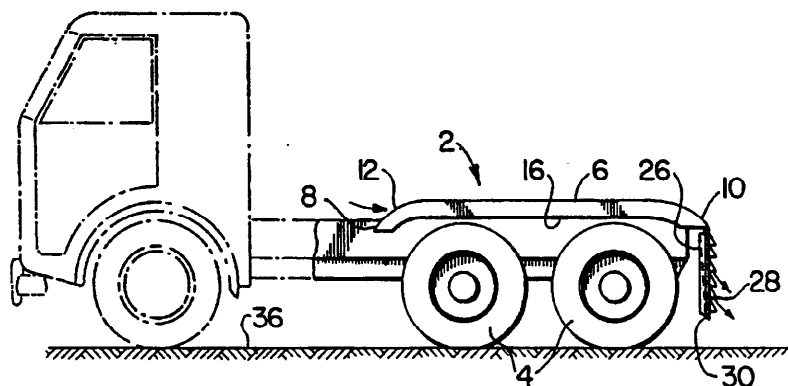
Primary Examiner—David M. Mitchell
Attorney, Agent, or Firm—Burke-Robertson

[57] ABSTRACT

A fender for a wheel or a set of wheels for one side of

an automotive vehicle, for controlling the wet weather spray and splash generated thereby when travelling on a roadway surface. The fender comprises a formed, rigid sheet mounted over and covering the wheels or set of wheels and downwardly curves at its forward and rearward ends. A removably downwardly depending skirt extends along the edges of the sheet. One or more air intake apertures in a forward, curved end of the sheet directs air from outside the fender to inside the fender and over the wheel or set of wheels covered thereby during forward movement of the vehicle. A spray shield in sheet form is adapted to be disposed above the roadway surface vertically depending from the rear of the rigid sheet and is spaced rearwardly from the vehicle wheel or wheels in a plane extending transversely to the vehicle. A plurality of rearwardly opening louvers in the shield extend, when the shield is in position, horizontally between its sides over a major portion of the area of the shield. The louvers permit flow of air and spray through the shield and cause a downward deflection thereof. The shield according to the present invention significantly reduces the hazard created by spray generated by a vehicle's tires by developing an airflow within the fender and as it leaves the fender which collects and downwardly deflects that spray to the surface of the roadway.

5 Claims, 2 Drawing Sheets



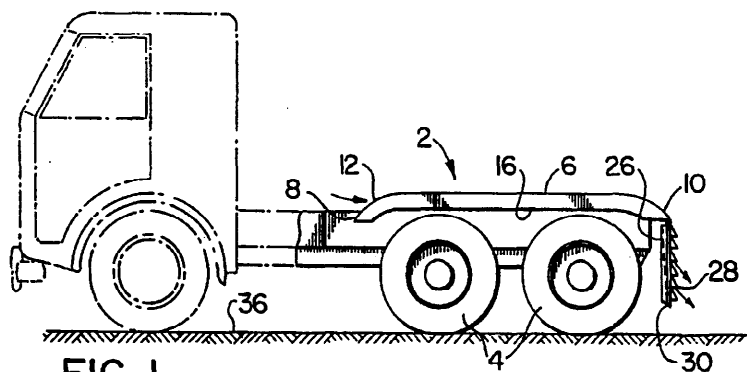


FIG. 1

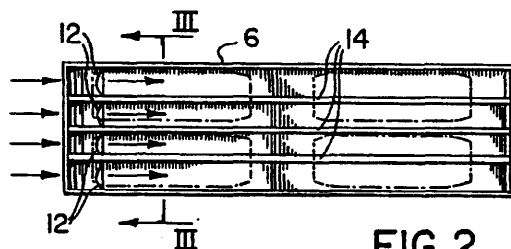


FIG. 2

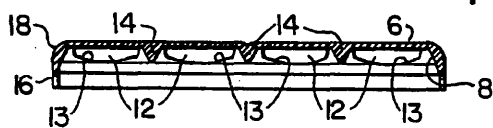


FIG. 3

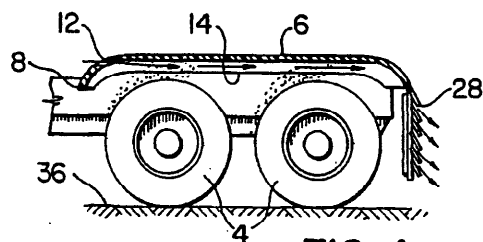


FIG. 4

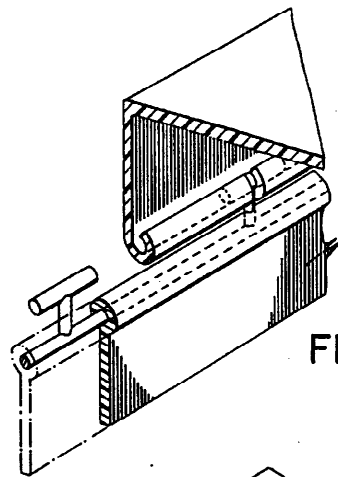


FIG. 5

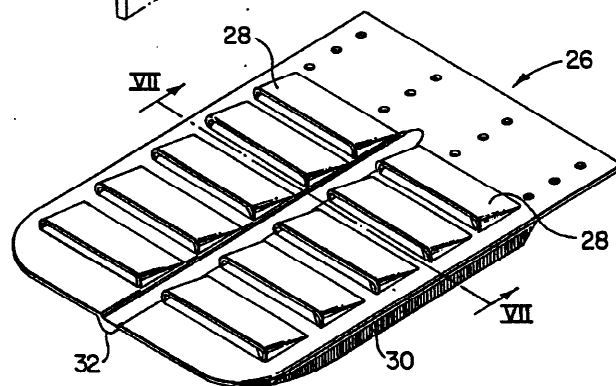


FIG. 6

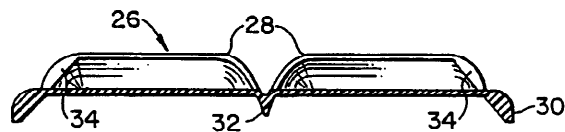


FIG. 7

SPRAY CONTROLLING FENDER

FIELD OF THE INVENTION

The present invention relates a fender device which controls wet weather spray and splash generated by the wheels of an automotive vehicle. It relates more particularly to a fender which is adapted to be suspended over each of the wheels, or each of the sets of wheels, on each side of an automotive vehicle, and particularly large vehicles such as trucks and trailers to restrict the spray of rain, dust, snow and rocks which may be thrown upwardly and rearwardly or laterally by such wheels.

BACKGROUND OF THE INVENTION

Particularly during conditions of rain or snow, heavy vehicles such as trucks, tractor trailers and buses generate clouds of spray either beside or behind them, as a result of the action of their wheels on the roadway surface, as they travel over such surface. As well, other road surface materials such as mud, pebbles, salt and dust may be propelled upwardly in a spray to either side or behind such vehicle. Such sprays are dispersed into adjacent traffic lanes making it dangerous or impossible for that vehicle to be passed by another, or making it dangerous or hazardous to follow behind such vehicle or for oncoming traffic to go by that vehicle.

Such problems have been previously recognized and many solutions proposed. For example, U.S. Pat. No. 4,192,522 of Morgan issued Mar. 11, 1980 describes a splash and spray control shield for the wheels of large vehicles consisting of a shield which covers the upper parts of a wheel, and has, at its forward end, a funnel-like air scoop which sits over the upper front half of the wheels and which defines an enlarged front opening and a constricted rear opening through which the flow of air from in front of the scoop is forcefully directed rearwardly along the top wall of the shield. A resilient shield extension is fastened to the rear section of the shield to downwardly direct the spray to the road surface. This construction of shield generates additional wind resistance on such a device; the faster the vehicle moves, the greater the wind resistance generated by the vehicle. The use of the scoop device to force air over the wheels, as well as the resilient shield extension at the rear of the shield generates increased pressure and turbulence within the device which can carry spray to the sides of the vehicle.

In my U.S. Pat. No. 4,660,846 issued Apr. 28, 1987, I described and illustrated a louvered spray shield to be placed behind the wheels of large vehicles, the louvers of which shield directed air through the louvers and downwardly towards the roadway surface, thereby significantly reducing the spray generated by the wheels of such a vehicle.

Other patents of general background interest are Wenham, et al U.S. Pat. No. 2,619,363 issued Nov. 25, 1952; Eaves U.S. Pat. No. 2,940,773 issued Jun. 14, 1960; Barry, et al U.S. Pat. No. 3,088,751 issued May 7, 1963; Salisbury U.S. Pat. No. 3,350,114 issued Oct. 31, 1967; Jones U.S. Pat. No. 3,279,818 issued Oct. 18, 1966; Iwanicki U.S. Pat. No. 4,334,694 issued Jun. 15, 1982; Brandon, et al U.S. Pat. No. 4,325,563 issued Apr. 20, 1982; and Grote, et al Canadian Patent No. 955,290 issued Sept. 24, 1974, all of these patents describing and

illustrating various constructions of vehicle splash guards which have been previously proposed.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide a device for providing better control the spray of moisture and other materials which is generated by the wheels of large vehicles during movement over a roadway surface. It is a further object of the present invention to provide such a device which can use air flow to achieve this control, without creating significant additional wind resistance and increased turbulence at higher vehicle speeds.

SUMMARY OF THE INVENTION

In accordance with the present invention, in order to achieve these objects, there is provided a fender for a wheel or a set of wheels for one side of an automotive vehicle, for controlling the wet weather spray and splash generated thereby when travelling on a roadway surface. The fender comprises a formed, rigid sheet mounted over and covering the wheels or set of wheels and downwardly curves in strealined fashion over a small portion of the upper surfaces of the wheels at its forward and rearward ends. A preferable removable, downwardly depending skirt extends along each edge of the sheet. One or more air intake apertures in the upper part of the forward, curved end of the sheet are provided to direct an even flow of air from outside the fender to inside the fender and over the wheel or set of wheels covered thereby during forward movement of the vehicle. A spray shield in sheet form is adapted to be disposed above the roadway surface vertically depending from the rear of the rigid sheet and is spaced rearwardly from the vehicle wheel or wheels in a plane extending transversely to the vehicle. A plurality of rearwardly opening, permanently opened louvers in the shield extend, when the shield is in position, horizontally between its sides over a major portion of the area of the shield. The louvers permit flow of air and spray through the shield and cause a downward deflection thereof.

In a preferred embodiment of the present invention the fender is provided, on the inner surface of the rigid sheet, with integral, formed guide ribs. These ribs extend in spaced parallel fashion forwardly to rearwardly on the sheet. These ribs facilitate air flow and restrict air turbulence within the fender.

The fender device according to the present invention may be incorporated in a construction of a new vehicle, or retrofitted to an old one. When in position over the wheels of a truck, trailer or the like, the fender in accordance with the present invention develops a steady, non-forced air flow over the wheels of the vehicle, and out the louvers in the spray shield at the back, where the air and spray is directed downwardly to the roadway surface. In this way, the device effectively reduces the upward turbulence and spray generated at the rear of the vehicle, behind and to the sides of the fender, thereby significantly increasing the highway safety, to the other vehicles, of vehicles carrying such fenders.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and advantages of the invention will become apparent upon reading the following detailed description and upon referring to the drawings in which:

FIG. 1 is a side view of a fender in accordance with the present invention over a set of trailer wheels;

FIG. 2 is a plan view, from below, of the fender of FIG. 1;

FIG. 3 is a front view cross-section along line I—I of the fender of FIG. 1;

FIG. 4 is a side section view of the fender of FIG. 1 along line IV—IV of FIG. 1;

FIG. 5 is a perspective view, in partial section, of the fender of FIG. 1, to the side, illustrating a detail of the suspension of a side skirt from the fender;

FIG. 6 is a perspective view of the spray shield at the rear of the fender of FIG. 1; and

FIG. 7 is a cross-sectional view of the spray shield of FIG. 5 along line VII—VII.

While the invention will be described in conjunction with an example embodiment, it will be understood that it is not intended to limit the invention to such embodiment. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

DETAILED DESCRIPTION OF THE INVENTION

In the drawings, similar features have been given similar reference numerals.

Turning to FIG. 1 there is illustrated a fender 2 in accordance with the present invention mounted in a multi-axial arrangement of a set of wheels 4. Fender 2 comprises a formed, rigid sheet 6 which is mounted over and covers wheels 4. Sheet 6 is curved slightly downwardly at its forward end 8, and rearward end 10 (with a greater radius of curvature) as illustrated. Sheet 6 may be made of any appropriate material such as an appropriate metal, fiberglass, plastic or the like. At the forward end 8 of sheet 6, situated in the curved portion thereof, are a plurality of apertures 12 extending across fender 2. Apertures 12 are formed, as can be seen in FIGS. 2 and 3, with a rounded arcuate base 13 (the corners of a rectangular slot would increase the turbulence of air entering the fender below sheet 6 and provide more opportunity for constriction for example by build-up of slush and ice, for lodging of debris. The size of the slots is important, since if the slots are too large too much air tends to enter fender 2 resulting in increased turbulence and forcing of air and debris outwardly, in a sideways direction, from beneath fender 2. On the other hand, if slots 12 are too small, the desired air flow from front to back within fender 2 is restricted and is not as efficient. Slots 12 are intended to be of an appropriate size so that an even flow of air is created from in front of fender 2, through slots 12 and beneath sheet 6, within fender 2 from front to back, as a truck moves. In other words, it is intended that the air pressure outside and surrounding fender 2 be the same as that within fender 2 during movement of the vehicle on which fender 2 is mounted.

On the lower surface of rigid sheet 6 are formed a plurality of longitudinally extending guide ribs 14, spaced in parallel fashion from side-to-side across sheet 6. These guide ribs 14 are important to assist in reducing turbulence which otherwise might develop beneath sheet 6 during movement of the vehicle, by assisting in the directing of air entering beneath fender 2 through apertures 12, from front to back beneath the fender. As well, as can be seen in FIG. 3, the lower edge 13 of aperture 12 is upwardly angled to deflect air entering

that aperture upwardly towards ribs 14. This feature further assists in reducing turbulence and facilitating air flow.

As can be seen in FIGS. 3 and 5, a removable skirt 16 made, for example, of a flexible material such as a rubber or a flexible plastic, downwardly depends from the edges 18 of sheet 6 along its length. These edges 18 are inwardly curled, as illustrated in FIG. 3, and provided with slots 20 through which appropriate T-like wire suspension hangers 22 can be fitted to rest on these curled edges 18. As can be seen in FIG. 5 the lower portions 24 of these suspension hangers 22 are embedded in, or otherwise secured to flaps 16. In this manner flaps 16 may be readily removed for servicing or replacement.

At the rear of sheet 6, downwardly depending from rear portion 10 is suspended a spray shield 26. This sheet is generally in sheet form, as illustrated in FIG. 6, and has a plurality of rearwardly extending, permanently opened louvers 28 mounted horizontally, between the edges of shield 26, over a major portion of the area of the shield. Forwardly extending side flanges 30 extend along opposite sides of the shield 26. Shield 26 is preferably made of a flexible material such as heavy duty rubber. Shield 26, when in position, has a forwardly extending V-shaped center 32 to minimize wind resistance on the forward surface of shield 26. In this construction, twin sets of louvers 28 are provided on either side of center 32 to equalize and balance the flow of air through the shield. As well, it is preferred to provide on the inside, forwardly oriented face of louvers 28, on their sides opposite from center 32, a plurality of reinforcing webs 34. The webs are each side of louvers 28 are preferably spaced from each other so as to permit air flow therebetween, thereby further facilitating and directing the flow of air as it passes through louvers 28.

The twin sets of louvers, while appropriate for larger, dual wheel sets of wheels on either side of the axial of a vehicle, may not be required for single wheels, in which case a shield 26 having a single set of louvers 28 will be adequate.

In operation, as a vehicle mounted with fenders 2 over each set of wheels 4 moves forwardly, air passes through apertures 12 and is directed, by the motion of the truck and guide ribs 14, to the rear below sheet 6. It is then directed downwardly to pass outwardly through louvers 18 in shield 16. As the speed of the vehicle increases, so does the flow of the air in this fashion within fender 2, this flow of air collecting droplets of water, dust particles or other debris, generated by the turning of wheels 4 into its stream (FIG. 4), and reducing air turbulence around these wheels. As well, when the air flow passes through shield 26, louvers 28 directed downwardly to be deposited on roadway surface 36. In this manner, there is a surprising reduction of spray which would otherwise be generated sideways or rearwardly with respect to wheels 4, over conventional fenders and any of the prior art devices. Moreover, as a vehicle mounted with fenders 2 travels faster, the efficiency of operation of fender 2, if anything, increases since the air flow beneath sheet 6 and out of louvers 28 becomes stronger, drawing more moisture and debris. An additional advantage, because of the construction of applicant's device, is that moisture and other debris which is drawn into the flow of air beneath sheet 6, being heavier than the air itself, tends to be expelled through shield 26 through lower louvers 28, thereby assisting in depositing of such moisture and debris more

directly on the pavement than in the air, with a resultant reduction in generation of spray behind the vehicle.

Because of the simple construction of fender 2, when compared with prior art devices previously referred to and intended for a similar function, the fender in accordance with the present invention may be made significantly lighter than such prior art devices. Also the fender 2 in accordance with the present invention, because of its construction, provides minimal wind resistance both at forward end 8 and rearward end 10. These features result in significant fuel economy, when compared to such prior art devices, for vehicles equipped with fenders 2 in accordance with the present invention.

While not illustrated, the fender 2 in accordance with the present invention is also designed to accommodate smaller wheels or single axle systems, such fenders being shortened in length or otherwise modified to suite the smaller wheels or single axle systems. They would still operate in a similar fashion to that of FIGS. 1 to 7.

Thus it is apparent that there has been provided in accordance with the invention a fender for a wheel or a set of wheels that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such alternatives, modifications and variations as fall within the spirit and broad scope of the invention.

What I claim is:

1. A fender for a wheel or set of wheels for one side of an automotive vehicle, for controlling the wet weather spray and splash generated thereby when travelling on a roadway surface, the fender comprising:

(a) a formed, rigid sheet mounted over and covering the wheels or set of wheels and downwardly curved in streamlined fashion over a small portion of the upper surface of the wheels at its forward and rearward ends;

(b) a downwardly depending skirt extending along each edge of the sheet;

(c) one or more air intake apertures in the upper part of the forward, curved end of the sheet to direct an even flow of air from outside the fender to inside the fender and over the wheel or set of wheels covered thereby during forward movement of the vehicle; the intake aperture or apertures having lower edged that are of upwardly curved, arcuate shape and being positioned and of such a size than an even flow of air from outside the fender to inside the fender, at about the same pressure inside the fender as around the fender on the outside, is achieved during forward movement of the vehicle; and

(d) a spray shield in sheet form adapted to be disposed above the roadway surface vertically depending from the rear of the rigid sheet and spaced rearwardly from the vehicle wheel or wheels in a plane extending transversely to the vehicle, a plurality of rearwardly opening, permanently opened louvers in the shield extending, when the shield is in position, horizontally between its sides over a major portion of the area of the shield, the louvers to permit flow of air and spray through the shield and cause a downward deflection thereof.

2. A fender according to claim 1 wherein guide ribs are provided on the inner surface of the rigid sheet, extending in spaced parallel fashion forwardly to rearwardly on the sheet, the guide ribs to facilitate air flow and restrict air turbulence within the fender.

3. A fender according to claim 2 wherein the shield is made of flexible material.

4. A fender according to claim 1 wherein the skirts and sheet edges are provided with means for releasable attachment of the skirts to the edges of the sheet.

5. A fender according to claim 2 wherein the guide ribs are integrally formed on the inner surface of the rigid sheet.

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